
THE HEALTH OF THE INOCULATED.



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A lecture on the above subject was delivered, on the 29th June 1901, at a meeting presided over by his Excellency the Governor of Bombay, at the Native General Library, Budhwar Peth, Poona, by Mr. W. M. Haffkine, C.I.E., Director-in-Chief of the Plague Research Laboratory, Bombay. His Excellency was accompanied by Captain Wood, A.-D.-C., and Lieutenant-Colonel Croly, R.A.M.C. Those present included Sir Charles Ollivant, K.C.I.E., and the Hon. Mr. J. Monteath, C.S.I., Executive Members of his Excellency's Council; Sir Andrew Wingate, K.C.I.E., Commissioner of Central Division, and Lady Wingate; Surgeon-General Bainbridge, I.M.S.; Mr. C. O. Quin, I.C.S., Secretary to Government; Mr. E. L. Cappel, I.C.S., C.I.E., Collector of Poona; Mr. M. Kennedy, Inspector General of Police; Captain J. K. Condon, I.S.C., Under Secretary to Government; Captain Collins, R.A.M.C.; the President and members of the Poona Municipality; a number of Medical officers, and a large gathering of European and native residents. The hall of the Library was crowded, a number of persons remaining standing.

His Excellency, who was loudly cheered on rising, said that Mr. Haffkine required no introduction to the meeting. He hoped all those present would profit by his advice in connection with combating plague. He had been authorised by Mr. Haffkine to say that anyone desiring to ask questions at the conclusion of the lecture might do so, and Mr. Haffkine would be glad to give any further information in his power.

Mr. Haffkine said: "Your Excellency, Ladies and Gentlemen,—Inoculation against plague has now been applied in India for four and-a-half years, and it may be assumed that those here present are familiar with the fundamental points of the subject. It has been found that persons inoculated with the plague prophylactic have a greater chance of escaping the disease than non-inoculated ones, and that when they are attacked notwithstanding inoculation, they have a greater chance of recovery than non-inoculated persons. When a large proportion of inhabitants get inoculated in a plague-stricken locality, the plague loses the character of an epidemic, and assumes that of a sporadic disease. It is also known that inoculation causes, for a time, pain at the seat of injection, and an attack of fever. None of us, however, is afraid of a temporary pain, or a rise of temperature for a day or two. What we want to know is whether the operation is likely to produce any injury to health or not. I may mention here in passing that the first stage in the formation of opinion on this matter was that some persons, who have never become known, spread a rumour that in three years' time the inoculated would develop leprosy. The rumour was very persistent, and deterred a number of people from being inoculated. I hardly think there is anyone here who requires help to pass judgment upon that rumour and those who spread it. There was no ground for forming such a monstrous conclusion; and those persons, not having had the three years to observe actual facts, were spreading the rumour with interested, malicious intentions.

INVESTIGATIONS IN PARIS.

The inception of anti-plague inoculation is to be looked for not necessarily in Bombay in 1896, but rather, perhaps, in investigations which were carried out in 1889-1893 in Paris, on cholera and its prevention by inoculation. As the result of those studies a method was worked out, which, in many respects, served subsequently as a basis for the prophylaxis of plague. Inoculation against cholera is also done with a material in many ways analogous to the plague prophylactic. When it is injected under the skin a swelling is formed, which becomes painful as time proceeds. The temperature of the patient rises, and he develops a genuine attack of fever, accompanied by symptomatic neural in that condition. The pain continues to increase for 10 to 15 hours, and the fever also. Then they subside. The general symptoms last for 24 to 36 hours, while the pain remains for 3 or 4 days, or even longer. Occasionally there is vomiting and in very exceptional instances momentary fainting. I describe these symptoms for a purpose which you will see presently. The studies on cholera were carried out in the famous Pasteur Bacteriological Institute. There is a large staff of experienced physicians and scientists attached to it. You are aware that one of the chief functions of a physician is to determine the disease from which a patient is suffering, and to

tell whether it is dangerous or not. When a patient is brought into a hospital the doctor in charge examines his pulse, his heart, his breathing, occasionally takes and examines also samples of his secretions, asks certain questions, and forms a conclusion. Sometimes the patient has slight, hardly perceptible symptoms, but the doctor, after examination, takes a serious view of the case. At others, the symptoms seem severe, but the physician is able to say at once that there is nothing very far wrong with him, and he will be hale and hearty in a day or two. Physicians are liable to make mistakes; but the more experience they have the fewer mistakes they make. The first patients inoculated against cholera were taken to the Pasteur Institute, and kept there under observation while the symptoms lasted, and sometimes for a considerable time after they had subsided. This was the easier, because gradually almost the entire staff of the Laboratory made up their minds to be inoculated, and became subjects for observation. At no moment was it considered that there was reason to apprehend ill consequences from the operation, not more than after a severe bruise, or a pricking of one's finger leading to a swelling and temporary suppuration, or other such accidents, sometimes very uncomfortable, which we go through in our daily life. It was only after having satisfied a number of keen observers who pronounced the effects of inoculation as of a trifling nature, that steps were taken to apply the system to the general public.

INOCULATIONS IN INDIA.

You may have heard that those inoculations against cholera were subsequently carried out in the North-Western Provinces of India, in the Punjab, Bengal, Behar, and in Upper and Lower Assam. A certain number of troops and civil people were also inoculated against cholera here, in Poona, at Kirkee, and at the Sassoon General Hospital, previous to the advent of the plague. At present anti-cholera inoculations are practised in a Government Laboratory in Purulia, for the benefit of people emigrating into the tea districts of Assam. During the first couple of years, from 1893 to 1895, the operation was performed on some 43,000 individuals in India. More than ten thousand of these were European and native soldiers, while a considerable proportion of the rest were coolies on the Assam tea estates. I mention these two groups of people because their health or liability to disease is watched over by competent persons. In no instance was there a suspicion aroused in the minds of the regimental medical authorities or of the physicians on the tea plantations as to any permanent ill effects caused by inoculation. The proof of this is that inoculation against *typhoid*, which is done on the lines of the anti-cholera inoculation, is now largely applied, as you probably know, amongst the troops in India and elsewhere, with the difference that the operators use much larger doses than those which we injected against cholera, and much more severe symptoms are produced. On the Assam tea estates the managers have testified in a similar manner to their being gratified with the results. At my last visit to Calcutta the Hon. Mr. H. H. Risley, Secretary to the Government of Bengal, was good enough to inform me that the planters had offered to pay a fee for inoculation, sufficient for the maintenance of two additional anti-cholera inoculation stations, *viz.*, one in Calcutta and one in Dhubri, on the Brahmaputra. Certain planters insist on the new coolies engaged in India being inoculated against cholera before they agree to take them out to Assam. No such condition of affairs would exist had the health of the thousands of coolies who were inoculated inspired the least apprehension amongst those who take so much trouble to get and maintain them on their estates. When at the end of 1896 the plan of anti-plague inoculation was worked out in Bombay, the staff of the Laboratory were inoculated first, and we made minute observations on the symptoms produced in us. The first injection was done with a dose four times larger than that adopted as a standard one in order to be certain that no danger would ensue to a person inoculated with a smaller dose. What struck us in those observations, and what you have possibly noticed already, was that the symptoms caused by the injection were in no way distinguishable from those that I described above as consequent on anti-cholera inoculation, which had been so minutely studied in Paris and afterwards observed and

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watched for years in India. In fact, if a person inoculated against cholera and one inoculated against plague were to describe their symptoms on paper, and the descriptions were shown to us, we would not be able to tell which refers to which. It was this similarity of symptoms that gave us the first re-assuring indication as to the effect of plague inoculation.

WORK IN BOMBAY.

Our first studies on plague were carried out in the Petit Laboratory, which owes its existence to the inspiration of Lord Reay, and forms part of the Grant Medical College, at the Jambetjee Jejeebhoy Hospital, in Bombay. The staff of the College and Hospital took a most sympathetic interest in our work, and one of the first who was satisfied that the new operation was harmless, and who testified to that by coming forward to be inoculated himself, was the Principal of the Grant Medical College, Lieutenant-Colonel Hatch, I.M.S. Similarly were inoculated, about the same time, Major, now Lieutenant-Colonel, Dimmock, I.M.S., Professor of Midwifery in the same College; Major Childe, I.M.S., Professor of Pathology; Major Herbert, I.M.S., Professor of Ophthalmology; and subsequently Major Lyons, I.M.S., First Physician and Professor of Medicine in the same College and Hospital, who joined upon the death of Surgeon-Major Manser. In a short time a number of the most authoritative physicians in Bombay, European and native, official medical officers and private practitioners, came to the same conclusion, and submitted themselves for inoculation. It is a matter of gratification to me to be able to quote among these authorities the head of the Medical Service of the Presidency, Surgeon-General Bainbridge, who not only got himself inoculated, but inoculated also the members of his family. Previous to that, Surgeon-General Harvey, the able Director-General of the Indian Medical Service, submitted himself to inoculation, in 1893, against cholera, and in 1898 against plague. It was the example of these gentlemen, whose competence in the matter of health could not be disputed, that encouraged thousands of people, rich and poor, in Bombay and elsewhere, to come forward for inoculation. Thus his Excellency the Viceroy thought it right to tell you here, in Poona, that previous to his starting for the plague-stricken districts he and his staff had also undergone the prophylactic inoculation. In due course mothers brought their children to be protected by the new "vaccination." A certain number of old and infirm persons presented themselves, in the hope, as they told us, that the inoculation, though devised against plague, might perhaps be of some good also for their chronic ailments. Such persons were done, first, with very minute doses, and afterwards with larger ones. As the number of the inoculated increased, they began, in the course of time, to take their share in the general diseases that afflict humanity, and in the general mortality. Everyone of you has friends who have undergone the operation. Thousands of such persons have remained in the same state of health as they were before inoculation. Many who had old-standing diseases, diabetes, rheumatism, chronic fevers, debility, or initial stages of consumption, have not shown any signs of aggravation afterwards. On the other hand, instances of a rapid improvement in health, or of a cessation of obdurate diseases amongst the inoculated are constantly brought to our notice. But, at the same time as some improve in their health subsequent to inoculation, so also cases of sickness, or of increase of a chronic sickness inevitably occur in others. Whenever the latter occurrence takes place, the question, so to say, spontaneously arises whether inoculation has or has not been responsible for it, and whether without inoculation the same disease or aggravation of disease would or would not have taken place? The reply to this question is given differently. Some consider that the number of cases in which a patient does not improve in his health after inoculation but, on the contrary gets worse, is insignificant; others that that number ought not to be considered as small; some think that the inoculation, on the one hand, and the sickness or aggravation of sickness, on the other, are mere coincidences in time, and that the same sickness or aggravation would have taken place also without inoculation; others maintain that there is an intimate connection between the effect of inoculation and the sickness or the aggravation of disease in the patient. You will not be surprised to find that, from the first, we kept a watchful eye on this matter, and were looking out for opportunities to test whether inoculation does, or is capable of doing, harm to any one, and whether we were quite right in thinking that its

effect was harmless. The cases of sickness and of death have been found to be indeed *very few*, and you will see directly what I mean by these words. In the majority of instances that number was so insignificant that we had, and have still, to search for explanations of that fact. The inevitable conclusion from this result was that in no case investigated was there reason to admit that inoculation possessed the faculty of causing sickness, or aggravating the condition of sickly individuals of the community.

THE EVIDENCE COLLECTED.

I have given on the table below a list of deaths that occurred in Poona in the following years:—

	1891.	1892.	1893.	1894.
Cholera.....	235	168	138	111
Small-pox	4	38	103	59
Fevers	1,610	1,682	1,691	1,767
Dysentery and Diarrhoea ...	150	158	155	147
Injuries	17	39	44	52
Other causes	1,030	1,091	1,157	1,362
Total.....	3,046	3,176	3,285	3,498

There was no plague, or inoculation, or any epidemic in Poona during these years, except a slight exacerbation of cholera in the beginning, and a slight general rise in the mortality figures, possibly attributable to an increase or influx of population. You will observe that in the first of those years cholera claimed over two hundred victims; small-pox very few, four; fevers caused some 1,600 deaths; dysentery, 150; 17 died of injuries; and over a thousand of other, undefined causes; in all over 3,000 people died. If you take the next year, 1892, the figures show only small changes. The number of deaths from cholera is between 100 and 200; that of small-pox is again small, namely, 38; the number of deaths from fevers is represented by almost the same large figure as in the year before; that of dysentery again almost the same. The number of deaths from injuries is small again, as in the year before, showing only the slight general tendency to rise alluded to above. Undefined causes are responsible for over a thousand deaths as before, and the total comes to 3,176. If you take the year following, *viz.*, 1893, practically the same figures are repeated; and so also in the next year. Imagine now that between the years 1891 and 1892 a new sewage system, or a good water-supply, or an irrigation canal, or, let us say, an inoculation, is introduced into the city, and suppose, for the sake of argument, that the whole of the inhabitants become exposed to that new condition. The table in front of you would furnish a guide in deciding as to whether the new factor has been indifferent to health, or has improved, or injured it. In the first case the year 1892 and the subsequent ones would show approximately the same total number of deaths and approximately the same distribution of the latter between various diseases; in the second case, the total should decrease, and certain diseases, fevers for instance, in the case of an effective drainage, or diarrhoea, in the case of a good water-supply, show a reduction in the number of victims; in the third, the reverse would take place. With regard to an individual person, who keeps healthy or falls sick, we are unable to say for certain whether his health has benefited or deteriorated on account of the new water-supply or drainage, or preventive, inoculation; and whether without the water-supply or inoculation that person would or would not have been as healthy, or otherwise; but we are able to decide whether the health of a population or of a large group of it has become worse, or better, or remained stationary in consequence of the new condition. It is the same as if you were to plant new forests or, on the contrary, cut down the existing ones, in the hills where your river has its source. The examination of a handful of water from the river would not show you the effect of the measure. But look at the whole river, and you will soon perceive whether it has remained the same, or improved, or deteriorated. A method similar to the above, but in many ways superior to it, consists in submitting to the new condition not the whole, but only a half, or a considerable portion of the population. This enables us, without waiting for the annual statistics, with their incidental and often disturbing variations, to appear, to observe the liability to sickness and death simultaneously, as these occur, in persons living under the old and the new conditions, both being subject to such other current influences as cause general variations in vital statistics.

I shall proceed to summarise the studies which we have carried out, so far, on the lines just

described; but before entering into details I must mention that there is an important difference between liability to acute and to epidemic diseases produced by infective microbes, and liability to other sicknesses and causes of deaths. It is a common and, of course, correct notion that weak and sickly persons are more exposed to deaths from so-called "general causes" or "ordinary diseases"; that infants, young children, very aged persons and persons organically unfit give a higher general mortality than others. With infectious diseases it is not always so. When a microbe gains access to a body, it is like a seed falling on a soil and trying to take root. As a rule, the better and richer the soil is, the easier the seed takes root. This is often the case with microbes causing acute diseases. French agriculturists are convinced that strong and healthy sheep are far more prone to be invaded by the anthrax bacillus and to die from anthrax, than others. Many an Assam tea planter will tell you that it is his strongest coolies that fall victims to cholera. Infants in arms, who die in such numbers from other causes, remain almost entirely exempt from plague. Young children give a better rate of recovery from that disease than adults; and women, though they are generally so much weaker than men, recover, as a whole, more easily from it than men.

THE KHOJAS OF BOMBAY.

I shall give you now the results of our inquiries into the general mortality in inoculated communities. You are possibly aware that the Khojas of Bombay—on the initiative of their Chief, his Highness Sir Aga Sultan Aga Khan, who was inoculated himself three times—availed themselves largely of anti-plague inoculation. In 1898 the officers of the Research Laboratory carried out an investigation into the incidence of deaths amongst that community during the four plague months of the beginning of that year. It appeared that altogether 184 deaths from all causes, including plague, occurred in the community during that period. We visited, in company of representatives of the Khoja Jamat, all the families in which those deaths occurred, and inquired into a number of particulars concerning the deceased, and as to whether he or she had been inoculated or not. It was ascertained that of the 184 deaths, 13 occurred amongst the inoculated and 171 amongst the uninoculated. The proportion of the inoculated and uninoculated parts of the community stood as 3,814 and 9,516. The number of uninoculated was thus about two and-a-half times larger than that of the inoculated, but the number of deaths in them was thirteen times as large. Thus the proportional mortality in the inoculated, plague included, was about five times smaller than that in the uninoculated. We made an attempt to separate deaths from plague and deaths from other causes. Further, in comparing the two parts of the community, we were mindful of the fact that, when people call at inoculation stations of their own accord, there is a tendency for the inoculated group to include fewer infants, or very aged or infirm people, than are included in the group who remain uninoculated. Small babies in arms are comparatively rarely brought forward for inoculation. There is no harm in this, as they do not seem to be subject to plague. But many old and infirm persons also abstain from being inoculated; also men come forward rather more willingly than women. Accordingly, in studying the instance just quoted, we excluded from the number of 171 deaths amongst the uninoculated all the deaths that occurred in infants below three and in aged persons above sixty; but we were unable to exclude deaths in sickly individuals, as we could not make out who among the deceased had belonged to that category. After making this partial correction there remained a difference of 89.7 per cent. in what stood as plague deaths, in favour of the inoculated; and in addition to that, the general mortality amongst them showed also 73.3 per cent. less than amongst the uninoculated. The distribution of deaths between plague and other causes in the general population is, of course, very uncertain. It is probable that the difference in the "general mortality" was caused partly by what were really plague deaths. On the whole there still remained such a considerable advantage in general health enjoyed by the inoculated as to be embarrassing and difficult of explanation.

In 1899 the mortality in that community was investigated again, this time in reference to the deaths that took place during the twelve months subsequent to the date on which the first enquiry had left off. The investigation was commenced by Surgeon-General Harvey, Director-General of the Indian Medical Service, and myself; after our departure for England it was concluded by Major Bannerman, I.M.S., together with Dr. Gibson, Captain Milne, I.M.S., and Dr. Marsh.

It was ascertained that during the period above-mentioned, 545 deaths had taken place in the community, and affected 473 households. The inmates of those households numbered in all 2,270, of whom 903 had been inoculated, and 1,367 remained uninoculated. Their distribution by ages, as well as by the deaths that occurred amongst them, was as follows:—(a) There were 280 children under 8 years, *viz.*, 240 uninoculated, who had 133 deaths, and 40 inoculated, who had 6 deaths; (b) 1,885 individuals of 3 to 60 years, *viz.*, 1,051 uninoculated, who had 232 deaths, 72 of the latter being stated as plague deaths and 834 inoculated, who had 120 deaths, of which 26 were acknowledged as deaths from plague; and (c) 105 people over 60 years of age, *viz.*, 76 uninoculated, with 44 deaths, of which 4 from plague, and 29 inoculated, with 10 deaths. It was clear to those who took part in the inquiry that the number of inhabitants, their distribution between inoculated and uninoculated, and the total number of deaths in each of the two groups were found out quite satisfactorily and accurately; but, as before, there was no means of ascertaining which of the deaths had been due to plague and which to other causes. The average mortality amongst the Bombay Khojas in the years 1892-1895, before the advent of plague, and when no exodus had reduced the number of inhabitants in the city, was 342. Of the 545 deaths that occurred among them during the plague year under enquiry, at least 203 were thus likely to have been due to plague; but only 102 had been recognised as such. This circumstance, together with the abstention of the infirm from inoculation, explains at least partially why inoculation caused seemingly such a great reduction in what is represented in the above data as non-plague deaths. However this may be, in this, as in the other case, the striking feature was again the smallness of the number of deaths that occurred among the inoculated.

THE PARSEE COMMUNITY.

An enquiry analogous to that made among the Khojas has been carried out in the Parsee community of Bombay. Fully a fourth of that community, following the lead of some of their most representative families, underwent inoculation against plague, many having done so repeatedly, at the advent of every plague epidemic. You are aware that the Bombay Parsees have in their Panchayat an admirable communal organisation, which, among other functions, keeps records of all occurrences that take place in that community. At the Panchayat's office, as well as at the office at the Towers of Silence, every death occurring, with a number of particulars concerning it, is registered, and the records thus collected are probably amongst the most complete and accurate that can be found in any community in the world. For several years they recorded carefully who of the deceased had been inoculated for plague, and who not. Some months ago a committee of Parsees, working under the auspices of Mr. Jamsetjee N. Tata, and which included as a member Shamsul-Ulma Jivanjee Jamsetjee Mody, Secretary to the Panchayat, was formed with the object of investigating and totalling up the incidence of deaths from plague and other causes in the inoculated Parsees comparatively to that in the uninoculated. The report of that committee is not ready for publication, and they were unable to give me detailed figures to be quoted on the present occasion. The general purport of their results is, however, as follows:—The average number of the uninoculated, taking the whole period, was some six times larger than that of the inoculated. During the three years and seven months covered by the enquiry there were altogether 5,950 deaths in the uninoculated and 251 in the inoculated. The committee has attempted to apportion the mortality to plague and other causes, and to make an accurate allowance for the difference in the age-constitution of the two groups, as well as for the social position of the individuals concerned, the locality in which they lived, &c. What their efforts were and are chiefly concerned with, is to find out the accurate or plausible reason why the number of deaths among the inoculated was so small. A considerable part of this result is attributed by them to the age-constitution of the two groups. It is possible that a complete and accurate explanation of the facts cannot be arrived at in the present stage of our knowledge, a number of further observations on the effect of the prophylactic being required. What is quite certain, however, is that the mortality figures of the inoculated Parsees, apart from their showing in an indisputable manner the protection against plague derived from inoculation, contain no indication of the health of the inoculated part of the

community having suffered from inoculation, but, if anything, show quite the reverse.

A RIGOROUS ENQUIRY.

A rigorous study made under conditions which permitted of eliminating a number of uncertainties inherent to observations on the general population, was made at Undhera, in the Baroda Taluka. Plague had affected the village badly, and in a short time one in every ten had died. The Baroda authorities wanted to form a definite opinion on the protective value of inoculation, and the villagers eagerly accepting the plan, the following experiment was carried out. On the 12th of February, 1898, all the inhabitants were paraded ward by ward, and family by family; and a committee, consisting of Baroda Civil and Medical officials and of Major Bannerman, I.M.S., and myself, visited every family paraded, and inoculated half of their numbers, *viz.*, half of the males, half of the females, and half of the children in each household separately. In doing so we were very careful to distribute the infirm between the inoculated and uninoculated as equally as possible; and whenever this could not be done, we put the weak rather into the group to be inoculated than into the other. Thus, when in a certain family there were two children, one sickly and another strong, we inoculated only the sickly, and on the next similar occasion we inoculated a strong child, and left a sickly uninoculated. In this way the population was divided into two groups in as equal a manner in regard to ages, sexes, and condition of health as can ever be done. By the time the epidemic was over, *viz.*, on the 26th of March, 1898, the results appeared strikingly favourable to the inoculated. The village was visited by the Director-General of the Indian Medical Service and a number of other officers, who carefully enquired into what took place. The difference of plague mortality in favour of the inoculated amounted to 89.6 per cent. On the 7th February, 1899, that is, a year later, we wrote to his Excellency the Divan of Baroda, requesting him to give us details as to the incidence of death from all causes that took place amongst the strong and the weak of the inoculated and uninoculated groups since the end of the plague epidemic. You will find his reply embodied in one of the printed reports on this table. It was to the effect that amongst the uninoculated there were 415 classed as strong people and 22 as weak; the former had 9 deaths, and the latter 2. Amongst the inoculated there were 471 classed as strong, and they had 9 deaths, and 42 classed as weak, and they had 2 deaths. Not only was there no increase in the mortality of those who had undergone inoculation, but the proportion of deaths, especially among the weak, was smaller than in those that remained uninoculated.

SOUTHERN MAHRATTA COUNTRY.

The field of observation which gave very important results, was that of the three manufacturing towns, Hubli, Dharwar and Gadag, in the Southern Mahratta Country. In the terrible epidemic which they had in the middle of 1898, almost the entire population of these towns underwent inoculation, upon the initiative and under the guidance of Mr. E. L. Cappel, who was then Collector of that district. From the first the results appeared so decidedly favourable that the operators, and chief amongst them Captain Lenmann, I.M.S., and Doctor (Miss) Corthorn, the latter now on duty in Poona, resolved to increase the dose prescribed in the Laboratory, and thus further reduce the cases that were still occurring, in small numbers, amongst the inoculated. In addition to that, they insisted on the operation being repeated within a short time, *viz.*, from four to ten days after the first inoculation. By this means they obtained results which, perhaps, were the best that we have ever had; but the symptoms caused by those increased doses and by the repetition of the operation within such a short period were severe, and in many instances frightened observers. A number of alarming paragraphs appeared in the local papers giving instances of alleged injuries suffered by the inoculated. As these statements were very persistent and very numerous, Government, on the suggestion of Mr. McNeil, I.C.S., Collector of Dharwar considered that those three towns were an excellent field for an enquiry as to whether inoculation did any harm. As you know, a Committee, consisting of Mr. Woodburn, I.C.S., then Commissioner of the Southern Division; Lieutenant-Colonel Channer, I.M.S., Deputy Sanitary Commissioner; your fellow-citizen, the Hon. Mr. Gokhale, and Lieutenant Hutchinson, I.M.S., as member and secretary, was appointed to make the enquiry. The Committee, as well as the local papers and private residents, went to great trouble in order to collect information about every case of sickness that occurred after inoculation, and to induce all those who had statements

to make of having suffered from it to come forward and explain. The result was that from amongst the 77,259 persons inoculated in those three towns, 524 statements were elicited as to cases of disease or suffering consequent on inoculation. The analysis which I am going to make is to ascertain whether this result contains or not an indication of the general health of the inhabitants having suffered from inoculation. On examining the cases the Committee found that only in regard to local abscesses, such as occasionally happen after vaccination against small-pox, *viz.*, in 34 of 61 cases reported, was there ground, much to our regret, to blame the inoculation; but that of the remaining 490 complaints, a number had existed in the patients long before they were inoculated, while the rest stood in no possible connection with inoculation. I shall assume, however, that all those complaints occurred after inoculation. The Committee obtained a number of statements regarding females and children; but I shall assume for a moment, that women were shy to come forward and report; and as children would not appear of their own accord, I shall assume also that of the male population only complaints referring to grown up people were brought before the Committee. The number of inoculated women is smaller than that of men, and that of children much smaller than the number of inoculated adults. In order, however, to further strengthen the conclusion, I shall assume that fully a half of the above 77,259 inoculated were women and a half of the male population were children; and that all the 524 evils complained of were brought forward not from amongst 77,259, but from a quarter of that number, *viz.*, some 19,000 individuals only. The Committee classified the complaints made according to diseases, and in the last column of the table which I now put before you, these 524 complaints are given in detail:—

Among the 174,000 Sepoys of the Native Army in India there were during 1898 :		19,315 Sepoys should have		At least 1-5 of above numbers in two years, <i>viz.</i>		At least 1-26 of same numbers in five months, <i>viz.</i>		The 77,259 inoculated in Dharwar Dt. brought to notice.
		Admissions to Hospital.	Invalided.	Admissions to Hospital.	Invalided.	Admissions to Hospital.	Invalided.	
Name of Disease.								Number of Complaints.
Rheumatism	2,102	201	420	40	84	8		121
Tubercle, various forms	484	79	97	16	19	3		1
Leprosy	18	11	4	2	1	..		Nil
Fever { Ague	33,314	89						
Remittent	2,161	3	7196	18	1436	4		28
Simple continuous	505	..						
Gastric Diseases { Dysentery	4,867	11	973	2	195	..		Nil
Diarrhoea (non epidemic)	916	2	183	..	37	..		Nil
Dyspepsia and Constipation	256	4	51	1	10	..		70
Other Gastric diseases	560	31	112	6	22	1		Nil
Weakness	Nil	Nil	Nil	Nil	Nil	Nil		30
Debility	1,346	437	269	87	54	17		12
Scabies	429	..						
Itching { Tinea and Ring-worm	603	..	382	1	76	..		22
Urticaria prurigo eczema, &c	678	4						
Pain { Myalgia	284	17	116	6	23	1		117
Neuralgia	298	15						
Ulcers	3,465	3	683	1	139	..		Nil
Bolls	2,876	..	575	..	115	..		Nil
Abscesses	Nil	Nil	Nil	Nil	Nil	Nil		61
Headache	31	1	6	..	1	..		10
Eye affections	2,582	69	518	14	103	3		6
Veneral diseases	4,372	133	874	26	176	6		16
Piles	210	19	42	4	8	1		5
Anemia	315	7	63	1	13	..		1
Scurvy	298	7	60	1	12	..		1
Paralysis, various forms	79	14	16	3	3	1		Nil
Epilepsy	63	20	13	4	3	1		Nil
Various other diseases	17,322	362	3,464	72	693	14		18
Total	80,632	1,539	16,125	305	3,225	59		524
Accidents and poisoning	9,547	79						
Grand Total	90,179	1,618						

The question is whether the table represents a state of affairs in any way worse than the normal. In order to know that I shall compare those complaints, coming from individuals of whom a certain number must have been, from the beginning, of a weakly constitution, and many of whom lived under unhealthy conditions of life,

with the diseases that occur normally in 19,000 sepoys of the Indian Native Army. In table LIII of the report of the Sanitary Commissioner with the Government of India for 1899, which was in every way a normal year for that Army, you will find the details from which this comparison has been made. In the Native Army, numbering some 174,000 men, there were 2,102 admissions to hospital for rheumatism in the course of twelve months, and 201 of them were so bad as to get invalided on account of that disease. The Dharwar Committee carried out their enquiry two years after the first epidemic, when the whole population had been twice inoculated, and five months after the last epidemic, when the operation had been almost as generally done over again. The fourth column of the above table shows that 19,315 robust Indians, such as the Native Army is composed of, would have had in two years 420 admissions for rheumatism, and in five months alone (column 6), 84. If you consider the circumstances of the comparison, you will not wonder at the fact that the population of the Dharwar district complained of 121 cases of rheumatism. On the data above quoted it is quite impossible to maintain that the inoculation has in any way increased the normal liability of the people to rheumatism. If from the case of rheumatism you pass to that of tubercle, the result is as instructive.

INOCULATION AND CONSUMPTION.

It happened a year or two ago, in Poona, that a young girl, of a rich and respectable family, who had been well till then, developed consumption. Such cases are of daily occurrence, every one, unfortunately, knows that. But she had been inoculated a few months before; and though, on enquiry, it was found that there were other members belonging to her family who had not been inoculated, but who had had the misfortune to suffer from the same disease, an idea somehow took root that it was inoculation that caused the disease in that poor girl. The question is: Does inoculation possess the faculty of increasing the prevalence of consumption or rendering it worse, beyond that which takes place normally, without inoculation? From among the many thousands inoculated in the Dharwar district, and out of the 524 complaints made, one was in regard to consumption, namely, in regard to a supposed aggravation of that disease in a man who had been already suffering from it at the time of inoculation; while if instead of 77,000 old and young, strong and weak, we were dealing with 19,000 sepoys not inoculated, and made an enquiry amongst them at the end of a period of two years, we would have found that 97 of them had developed various forms of tubercle, and 16 had been invalided on account of that disease. In five months alone 19 sepoys would show signs of that disease. Neither, therefore, that solitary statement in Dharwar, nor the case of the young girl in Poona give us any ground to attribute to inoculation the power of causing or aggravating that disease. Taking now the case of leprosy, which was prophesied to supervene in three years after inoculation. In none of us, who was inoculated *four and-a-half years back*, nor among the thousands inoculated at Dharwar, was there a single case of that disease, nor, I hope, have you ever heard of such a thing among your inoculated friends and acquaintances; while if even *four* such cases had been ascertained to have occurred among the inoculated in Dharwar, there would have been no reason to ascribe those to inoculation, as four cases of leprosy may be discovered among 19,000 non-inoculated sepoys in two years' time. To take one or two instances more. For gastric diseases, 19,000 young men of the Army would have had in two years 1,320 admissions, and in five months 264; the Dharwar district people complained of 70 cases of dyspepsia and constipation. 19,000 sepoys have in two years 269 cases of debility and in five months 54, the number of those invalided on this account being 87 and 17; while the Dharwar people complained of 42 cases of weakness and debility. 19,000 sepoys would have had in two years 7,196 admissions for fever, and in five months 1,439, while, I believe, some 200 are constantly down with it; the Dharwar people brought to notice 28 people suffering from fever; and so on. On the whole, the number of cases of diseases complained of by the inoculated inhabitants of the three towns was *thirty times* less than is observed in normal years in one-fourth of their number, of the pick of the Indian population represented by the Army. We may therefore safely admit the possibility—as I admit it—that the number of various sicknesses was much larger than that reported to the Committee; for, were it, as we have seen, even thirty times as large, that would have only shown that the inoculation had left the inhabitants of those towns in four times as perfect a state of health as is enjoyed by the sepoys of the Army.

POONA CANTONMENT.

I shall detain you only with one instance more, that referring to the Cantonment of your own town. You are aware that a large number of people were inoculated there in 1899 and 1900, under the auspices of General Burnett and the Cantonment plague authorities. While the city suffered greatly from plague, the Cantonment showed a remarkable reduction in its annual plague occurrences and deaths. Between the month of November, 1900, and March, 1901, the Inspector of Inoculation, Dr. E. L. Hunt, in co-operation with Captain Gunn and Captain Collins, carried out, under the orders of General Burnett, a detailed enquiry as to the incidence of death in the inoculated and the uninoculated. There was a number of families who escaped both plague and death from other causes. Dr. Hunt investigated only such households as had been afflicted by a death from any cause or by an attack or death from plague. The facts which he collected show that there were, amongst such households, 183 in which one part of the members had been inoculated and another remained uninoculated. These, therefore, represented the most comparable and instructive groups of the population. Excluding from comparison children under two, who almost all remained uninoculated, and amongst whom the general death-rate is, of course, high, the inoculated members of those households numbered 506, and the uninoculated 391.

Amongst the 391 uninoculated members of affected families there were 36 attacks and 30 deaths from what had been recorded as plague, and amongst the 506 inoculated, 17 attacks and 11 deaths. As regards death attributed to causes other than plague there were 64 among the uninoculated, but only a half of that number, *viz.*, 32, amongst the larger number of inoculated. The same remark as to the greater percentage of infirm persons amongst uninoculated and as to uncertainty of the distinction between plague and non-plague applies, of course, to this case also. I do not calculate upon the above figures the proportional incidence of plague amongst the inoculated and uninoculated, for that additional reason mentioned already that, apart from these households, there was a large number of others, some having inoculated and others uninoculated members, who escaped plague or deaths, and who must be compared also in estimating the reduction of plague by inoculation; but the facts just quoted will show you again that, apart from the reduction of what was recognized to be plague, we are confronted not with an excess, but with a very reassuring paucity of deaths in inoculated.

THE ARGUMENTS SUMMARISED.

The following is a summary of what has been stated above. On examining the effects caused by inoculation the best authorities have come to the conclusion that it is not of a nature to injure the health of the inoculated. A number of physicians, possessed of the highest qualifications, have testified to that by being inoculated themselves. Among the vast number of persons inoculated, who include infants of 10 days of age and old people of over 80, as well as persons suffering from various chronic and organic diseases, the largest majority remain in the same state of health as they were before inoculation; a certain proportion improve, and others get worse. When examining an isolated case of a person who has been inoculated and who subsequently either improves in health, or else develops some disease, or shows an aggravation of his chronic disease, there are no means of knowing whether that person, without inoculation, would or would not have similarly improved or similarly developed the same disease; but the examination of whole groups of inoculated and uninoculated persons living together and belonging to the same races, castes, social position and families, and comparable in every other respect, enables us to find out whether the health of the inoculated has suffered or not. The investigations so far made have shown that the number of cases of sickness and of death in the inoculated has been so small, and often so much smaller than that in the uninoculated, as to be difficult of complete explanation; and in no instance did the inoculated show more cases of disease or deaths than the uninoculated. The rule remained true in cases when the two groups compared were people of the same physique and ages, as was the case in Undhera; and even in cases when the uninoculated group taken for comparison with the inoculated represented people of much stronger physique, in the prime of life, as was done above in the case of the Dharwar district. Observations on the effect of inoculation upon specific diseases are being carefully recorded, and no doubt much further light will be thrown in the course of time on the facts summarised

above.—Your Excellency, Ladies and Gentlemen. I must thank you now for the patience with which you have so kindly listened to this long discourse."

INOCULATION OF AGED PEOPLE.

Lord Northcote enquired whether any one desired to ask any question.

A gentleman wished to know up to what age it was safe to be inoculated, and Mr. Haffkine explained that

with aged persons they acted upon the plan of giving, first, very small, tentative doses ; and the effects being ascertained, and the patient re-assured, a larger dose was given. Latterly people had been inoculated up to and above 80 years of age.

No other explanations having been asked for, Lord Northcote proposed the vote of thanks to the lecturer, which was carried with applause



